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PCT App. No.: PCT/FI2003/000784

Claim Listing

1–10. (cancelled)

11. (new) A method for determining a radial modulus of elasticity of a paper web or a corresponding web-like material, which can be reeled or wound on a reel, in which method the connection between the force and deflection of a web material arranged in layers is measured, wherein the method comprises the steps of:

reeling or winding the web material to form a reel in a reeling or winding position, the reel defining a reel axis and a radial direction toward the reel axis;
transferring the reel from the reeling or winding position to a measurement position;
and
making measurements of force and deflection so as to allow calculating the radial modulus of elasticity of the reel of the web material in the measurement position outside the reeling or winding position.

12. (new) The method of claim 11, wherein the reel of web material is loaded with a force in the radial direction which is predetermined, and deflection of the reel in the radial direction that corresponds to the force is measured and registered.

13. (new) The method of claim 12, wherein while the reel of web material is being loaded with the predetermined force, a curve is obtained of the deflection of the reel in the radial direction as a function of the force.

14. (new) The method of claim 13, wherein the curve obtained is compared to a theoretically calculated curve of deflection of the reel in the radial direction as a function of the force.

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15. (new) The method of claim 14, wherein when the theoretically calculated curve of deflection of the reel in the radial direction as a function the force corresponds to the curve obtained from the measurement results, the radial modulus of elasticity is estimated from elastic parameters that have been used in calculating the theoretically calculated curve of deflection.

16. (new) The method of claim 12, wherein the reel is loaded with a planar surface of a press member moving in the radial direction toward the reel axis.

17. (new) The method of claim 16, wherein the force is measured by a force sensor positioned in the press member loading the reel and the force sensor being in contact with the reel.

18. (new) The method of claim 17, wherein the force sensor is also utilized to determine a loaded area extent on the reel.

19. (new) The method of claim 18, wherein the deflection of the reel in the radial direction is determined on the basis of the loaded area extent on the reel.

20. (new) The method of claim 19, wherein the deflection of the reel in the radial direction is determined on the basis of the loaded area extent on the reel.

21. (new) The method of the claim 12, wherein the force is measured by a force sensor positioned in a press member loading the reel and the force sensor being in contact with the reel.

22. (new) The method of claim 21, wherein the force sensor is also utilized to determine a loaded area extent on the reel.

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23. (new) The method of claim 11, wherein a profile of the radial modulus of elasticity of the web material is determined by performing a force and a deflection measurement at different points in the axial direction of the reel.

24. (new) The method of claim 23, wherein the profile is measured by moving a press member in an axial direction of the reel and performing the force and the deflection measurements at the different points with the press member.

25. (new) The method of claim 11, wherein the radial modulus of elasticity of the web material is determined by performing a force and a deflection measurement on different adjacent reels by transferring a press member successively on top of said adjacent reels.

26. (new) The method of claim 11, wherein the web material is paper.

27. (new) A method for determining a radial modulus of elasticity of a paper web that can be reeled or wound on a reel, in which method the connection between the force and deflection of the paper web arranged in layers in the reel is measured, wherein the method comprises the steps of:

reeling or winding the paper web to form a reel in a reeling or winding position, the reel defining a reel axis and a radial direction toward the reel axis;

transferring the reel from the reeling or winding position to a measurement position;
and

making measurements of force and deflection so as to allow calculating the radial modulus of elasticity of the reel of the paper web in the measurement position outside the reeling or winding position.

28. (new) The method of claim 27, wherein a profile of the radial modulus of elasticity of the paper web is determined by performing a force and a deflection measurement at different points in the axial direction of the reel.

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29. (new) The method of claim 28, wherein the profile is measured by moving a press member in an axial direction of the reel and performing the force and the deflection measurements at the different points with the press member.

30. (new) The method of claim 27, wherein the radial modulus of elasticity of the paper web is determined by performing a force and a deflection measurement on different adjacent reels by transferring a press member successively on top of said adjacent reels.